UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/816,548	03/26/2001	Hiroyuki Ohmori	SON-2055	9511

23353 7590 03/23/2004

RADER FISHMAN & GRAUER PLLC
LION BUILDING
1233 20TH STREET N.W., SUITE 501
WASHINGTON, DC 20036

EXAMINER	
UHLIR, NIKOLAS J	

ART UNIT	PAPER NUMBER
1773	

DATE MAILED: 03/23/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/816,548	OHMORI, HIROYUKI	
	Examiner	Art Unit	
	Nikolas J. Uhlir	1773	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 January 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 3-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 and 3-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *27 January 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. This office action is in response to the amendment/arguments dated 1/27/2004. Currently, claims 1, and 3-18 are pending, claims 17-18 withdrawn from consideration.

Rejection Withdrawals

2. The rejection of claims 1, and 3-16 under 35 U.S.C 112 first paragraph for failure to meet the written description requirement because of the "sequential stacking requirement" has been rendered moot by the amendment and is therefore withdrawn.

3. The rejection of claims 1, and 3-16 under 35 U.S.C 112 first paragraph for failure to meet the written description requirement because of the "wherein each stacked layers has an Ru concentration of at least 20 at%" has been rendered moot by the amendment and is therefore withdrawn. (Note the interpretation of the amended claim language set forth below as section 8 of this office action)

4. The amendment to claim 16 coupled with applicant's arguments is sufficient to overcome the 35 U.S.C 112 second paragraph rejection of this claim. Accordingly this rejection is withdrawn (note the interpretation of this claim set forth below at section 27 of this office action).

Drawings

5. Figure 15, which was inserted by the amendment dated 1/27/2004, is accepted by the examiner and does not constitute new matter.

Claim Rejections - 35 USC § 103

6. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

7. Claims 1, 4-5, 12, and 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Futamoto et al. (US6183893) in view of Futamoto et al. (US6383667).

8. Claim 1 requires a perpendicular magnetic recording medium comprising: a non-magnetic substrate; a non-magnetic metal ground layer formed on a main surface side of the non-magnetic substrate and containing ≥20 at. % Ru; and a magnetic layer formed on the non-magnetic metal ground layer and having a metal magnetic thin film, wherein the non-magnetic metal ground layer is constructed by layering a plurality of layers, the plurality of layers having an Ru concentration of ≥20at%, and includes compositions containing Ru and an element other than Ru.

9. For the purpose of this examination, the examiner interprets the limitation "wherein the non-magnetic metal ground layer is constructed by layering a plurality of layers, the plurality of layers having an Ru concentration of ≥20at. %" to require that the **total concentration** of Ru present in the plurality of layers (**not each layer**) is ≥20 at.%. Such an interpretation is the broadest reasonable interpretation that is consistent with the specification viewed as a whole. Specifically, page 8 lines 5-6 (in reference to a *single* non-magnetic metal ground layer) states: "[A] non-magnetic ground layer [2] formed on the substrate 1 and containing Ru at a concentration ratio of 20 at. % or more. Further, page 12, lines 19-20 (in reference to a *plurality* of non-magnetic metal ground layers) states: "[T]he non-magnetic metal ground layer 2 may be made by layering a plurality of layers having different compositions of Ru and an element other than Ru." Thus, the specification provides clear support for a single non-magnetic metal

ground layer containing ≥20 at. % Ru **or** a plurality of non-magnetic metal ground layers, wherein the plurality of non-magnetic metal ground layers may each contain differing amounts of Ru or an element other than Ru, but the plurality as a whole contains ≥20 at. % Ru. Further, the term "plurality" is interpreted to mean "two or more." Finally, the limitation: "and includes compositions containing Ru and an element other than Ru" is interpreted to mean that the non-magnetic metal ground layers could be Ru or a Ru alloy containing ≥20at. % Ru.

10. Bearing the above interpretation in mind, Futamoto '893 teaches a perpendicular magnetic recording medium comprising a substrate, a first underlayer directly on the substrate, a second underlayer directly on the first magnetic layer, and a perpendicular magnetic layer directly on the second underlayer (column 5, lines 45-60). The first underlayer is suitably made from Ru, Ti, or an alloy containing Ru or Ti as a main component with Cr, V, Mo, or W (column 9, lines 15-25).

11. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the first underlayer of Futamoto '893 from Ru, as Futamoto '893 recognizes the equivalency of Ru to the other materials listed as suitable for this purpose.

12. Further, Futamoto '893 teaches that the second underlayer has a saturation magnetization <50emu/cc, and is chosen so as to have a lattice constant within 5% of the magnetic layer (column 9, lines 40-45). Suitable materials for this purpose include Co alloys containing up to 50 atomic % of an additive element (column 9, lines 30-38). In at least one specific embodiment, Futamoto '893 teaches the use of a weakly

magnetic CoRu alloy containing 35 atomic % Ru as the second underlayer (column 13, lines 25-27).

13. However, Futamoto '893 does not teach the use of a plurality of *non-magnetic* metal underlayers, wherein the plurality of layers contains ≥20 at. % Ru, as required by claim 1.

14. However, with respect to this deficiency, Futamoto '667 teaches many different CoRu alloys that are suitable for use as second underlayers between a first underlayer and a magnetic layer. Similar to Futamoto '893, the second underlayer is chosen so as to have a lattice constant within 5% that of the magnetic layer (column 14, lines 51-54). This second underlayer is weakly magnetic or non-magnetic, with CoRu alloys containing >34 at% Ru being nonmagnetic (column 13, lines 55-65). Suitable CoRu alloys include those containing from 35-75 atomic % Ru (column 18, table 4).

15. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize a non-magnet CoRu alloy containing >35 atomic % Ru as taught by Futamoto '667 as the second underlayer utilized in Futamoto '893.

16. One would have been motivated to make this modification given that the non-magnetic CoRu alloys containing >35 atomic % Ru taught by Futamoto '667 meets all of the requirements of the 2nd underlayer of Futamoto '893, as these alloys are taught to be suitable for use as a second underlayer between a perpendicular magnetic layer and a first underlayer, and are capable of having a lattice parameter within 5 at% of a perpendicular magnetic layer deposited in contact with the second underlayer. Further, the CoRu alloys containing >35 at% Ru taught by Futamoto '667 are non-magnetic, and

thus meet Futamoto '893's requirement that the second underlayer should have a saturation magnetization <50emu/cc.

17. The examiner recognizes that the 1st underlayers of Futamoto '667 and Futamoto '893 have different crystal structures, in that the 1st underlayer of Futamoto '667 has a B2 crystal structure, whereas the 1st underlayer of Futamoto '893 has an hcp crystal structure. However, the purpose of the second underlayer in both of these references is identical, namely to lattice match with the perpendicular magnetic layer. Thus, one of ordinary skill in the art would be motivated to form the 2nd underlayer of Futamoto '893 with the materials utilized in Futamoto '667 with a reasonable expectation of success.

18. Thus, the limitations of claim 1 are met, as the combination of Futamoto '893 with Futamoto '667 results in the formation of a recording medium having a 1st underlayer of non-magnetic Ru on the substrate and a second underlayer of non-magnetic CoRu containing >35 at% Ru directly on the 1st underlayer and below the magnetic layer.

19. The limitations of claim 4 require the non-magnetic metal ground layer to be made of an alloy of Ru and at least one material selected from Cr, Ti, Ta, Zr, Hf, Fe, Co, Mn, Si, Al, Ag, Au, and Ir, wherein the composite ratio of the Ru concentration in the alloy is ≥50 at%. The examiner interprets this requirement to simply mean that one of the plurality of layers required by claim one is required to have the required composition. As set forth above for claim 1, Futamoto '667 teaches that CoRu alloys containing from 35-75 at% Ru are suitable for use as second underlayers in a recording

medium having similar structure to that of Futamoto '893. CoRu alloys containing 35 atomic % Ru and ≥50at% Ru are specifically taught in Table 4 of Futamoto '667.

20. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize a CoRu alloy containing ≥50 at% Ru as taught by Futamoto '667 as the second underlayer in the recording medium taught by Futamoto '893, as Futamoto '667 recognizes the equivalency of CoRu alloys containing >50 atomic % Ru to a CoRu alloy containing 35 atomic % Ru.

21. Futamoto '893 as modified by Futamoto '667 does not explicitly teach a magnetic recording medium utilizing a non-magnetic metal ground layer made of an alloy of Ru and at least one kind of material selected from W, Mo, V, Nb, and B, wherein the composite ratio of Ru in the alloy is 20 at % or more, as required by claim 5.

22. The examiner interprets the limitations of claim 5 to require that only one of the layers is the multilayer non-magnetic metal ground layer is required to have this composition. Bearing this interpretation in mind, it is noted that Futamoto '667 teaches suitable materials for the second underlayer include alloys of CoRu alloys and CoRuCr alloy, such as $CoRu_{35}$ and $CoRu_{20\text{-}30}Cr$ alloys (Futamoto '667, column 16, lines 30-41). Further, Futamoto '893 teaches that that the second underlayer can comprise an alloy of Co with one or more elements selected from Cr, W, Nb, V-Mo, Ti, Re, or Y (Futamoto '893, column 9, lines 25-35).

23. Therefore it would have been obvious to one with ordinary skill in the art at the time the invention was made to utilize a CoRuCr alloy containing 20-30 atomic % Ru as taught by Futamoto '667 as the 2nd underlayer in Futamoto '893, as Futamoto '667

recognizes the equivalency of a $CoRu_{35}$ alloy and $CoRu_{20-30}Cr$ alloys as suitable alloys for use as 2nd underlayers between a first underlayer and a magnetic layer.

24. Further, it would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute W, V or Nb for the Cr in the $CoRu_xCr_y$ 2nd underlayer utilized by Futamoto '893 as modified by Futamoto '667, as Futamoto '893 recognizes the equivalency of W, V, and Nb to Cr as suitable elements for use in Co alloy 2nd underlayers.

25. Claim 12 requires the magnetic layer to comprise 0.5-25 at% of one of the elements listed. Futamoto '893 teaches an embodiment wherein $CoCr_{17}Ta_5$ is utilized in the magnetic layer (column 11, lines 55+). Thus, the limitations of claim 12 are met.

26. Claim 15 requires the medium of claim 1 to comprise a plurality of magnetic layers separated by at least one separation layer, wherein the separation layer is Ru singly or an ally of Ru with one of the elements listed. In a specific embodiment, Futamoto '893 teaches a recording medium comprising a lower magnetic layer 24, and upper magnetic layer 26, and an intermediate layer 25 between the upper and lower magnetic layers. This intermediate layer is made of a $CoRu_{45}$ alloy (column 13, lines 10-39). Thus, the limitations of claim 15 are met.

27. Regarding claim 16, the examiner interprets this claim to require the intermediate layer to be either pure Ru, or a Ru alloy containing at least one of the components listed in group 1 and group 2. This interpretation is commensurate in scope with the specification and the applicant's arguments dated 1/27/2004 (see page 10, paragraphs 5-6). Bearing this interpretation in mind, it is noted that Futamoto '893 teaches that

suitable materials for forming the interlayer between the two magnetic layers include Ru, Pt, Pd, Ir, Re, or Hf (see column 5, lines 5-16).

28. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize a pure Ru layer to as taught by Futamoto '893 to form the intermediate layer, as Ru is taught to be equivalent to the other materials listed as suitable for use as an intermediate layer between two magnetic layers.

29. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Futamoto '893 as modified by Futamoto '667 as set forth above for claim 1, further in view of Lal et al. (US5356522).

30. Futamoto '893 as modified by Futamoto '667 fails to teach a magnetic recording medium having non-magnetic metal ground layer comprising a plurality of layers containing at least 20 atomic %Ru, wherein the ground layer has a graded composition such that the composition of the non-magnetic metal ground layer continuously changes, as required by claim 3.

31. It is noted that the examiner interprets the limitations of claim three to merely require that some portion of the gradient contains >20 at. % Ru, as is commensurate in scope with the specification and the language of claim 1.

32. However, with respect to the deficiencies of Futamoto '893 and Futamoto '667, Lal et al. (Lal) teaches a magnetic recording medium that utilizes an underlayer having an axial composition gradient. The portion of the underlayer adjacent to the substrate is made of one composition, the portion of the underlayer adjacent the magnetic layer is made of a different composition, and the composition of the underlayer gradually

changes from the substrate side to the magnetic layer side (column 5, lines 40-58). Due to the continuous gradient between the substrate side composition and the magnetic layer side composition, the underlayer avoids interface discontinuities (column 9, lines 40-45).

33. Therefore it would have been obvious to one of ordinary skill in the art to utilizes the method taught by Lal et al. to form an axial composition gradient between the first (Ru) and second (Ru alloy) underlayers taught by Futamoto '893 as modified by Futamoto '667.

34. One would have been motivated to make this modification in light of the teaching in Lal that interface discontinuities in then underlayer can be avoided by forming an axial composition gradient within the underlayer.

35. The examiner acknowledges that Lal is directed towards an underlayer having an axial composition gradient between a substrate side composed of Ti and a magnetic layer side composed of Cr. However, there is no teaching in Lal that the advantage of the axial composition gradient, namely the avoidance of interface discontinuities would be unattainable if other substrate side and magnetic layer side compositions were utilized. Further, one of ordinary skill in the art would expect interface discontinuities to occur between the lower underlayer (i.e. Ru) and upper underlayer (i.e. CoRu) utilized in Futamoto '893 as modified by Futamoto '667, as a CoRu alloy layer would be expected to have a smaller lattice parameter than a pure Ru due to the fact that Co has a smaller atomic radius than Ru. Thus, one of ordinary skill in the art would have been

motivated to modify Futamoto '893 as modified by Futamoto '667 with the teachings of Lal with a reasonable expectation of success.

36. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Futamoto '893 as modified by Futamoto '667 as applied to claim 1 above, and further in view of Shiroishi et al. (US4833020).

37. Futamoto '893 as modified by Futamoto '667 does not teach a non-magnetic metal ground layer made of an alloy of Ru and at least one of Cu, Ni, Pd, Pt, Y, and C, wherein the amount of Ru in the alloy is ≥80 at. %, as required by claim 6.

38. The examiner interprets the limitations of claim 6 to require that the total amount of Ru in the plurality of non-magnetic metal ground layers must be ≥80 atomic %.

39. Bearing this in mind, Shiroishi et al. teaches a magnetic recording medium that comprises a substrate, a first underlayer, a second underlayer, and a magnetic layer, wherein the second underlayer comprises an element selected from Cr, Mo, W, Ru, Os, Pd, V, Nb, Hf, Rh, Pt, or Ir and up to 20% of an element selected from Zr, Si, Ti, Y, Sc, Al, C, Ge, Sb, And Cu. Shiroishi et al. teaches that magnetic media with improved signal to noise ratio are formed when a second underlayer of this type is utilized (column 2, line 13-column 3, line 2).

40. Therefore it would have been obvious to one with ordinary skill in the art at the time the invention was made to substitute an Ru underlayer containing up to 20 atomic % of Cu or C as taught by Shiroishi et al. for the CoRu underlayer taught by Futamoto '893 as modified by Futamoto '667.

41. One would have been motivated to make this modification due to the teaching in Shiroishi et al. that magnetic media exhibiting improved signal to noise ratio are formed when a second underlayer comprising an alloy of Ru with up to 20 atomic % of C or Cu is utilized. Regarding the specific selection of Ru, Cu and C, Ru is taught to be equivalent to the other elements listed as suitable for the main component of the second underlayer, and Cu or C are taught to be equivalent to the other elements listed as suitable for the secondary components of the second underlayer.

42. The limitations of claim 6 are met when a Ru 1st underlayer and a RuX_{20} second underlayer (where X is Cu or C) is utilized, as the total amount of Ru in the plurality of underlayers will be $\geq$80%.

43. Claims 7-8 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Futamoto '893 as modified by Futamoto '667 as applied to claim 1 above, and further in view of Suzuki et al. (US6335103)

44. Futamoto '893 as modified by Futamoto '667 does not teach a non-magnetic metal ground layer that contains oxygen and or nitrogen, as required by claim 7, specifically 0.2-10 at. % O or N, as required by claim 8. The examiner interprets the requirements of claims 7-8 to require the concentration of oxygen in the entire ground layer must be in the range of 0.2-10 at. %, not that the amount of O or N in each layer of the ground layer to have the recited composition.

45. However, Suzuki et al. teaches that adding 0.1-10 at. % of oxygen to a non-magnetic underlayer of a magnetic recording medium reduces the grain size of the

underlayer, which in turn reduces the noise of a magnetic layer deposited on the underlayer (column 11, lines 38-46)

46. Therefore it would have been obvious to one with ordinary skill in the art at the time the invention was made to add 0.1-10 at. % oxygen as taught by Suzuki et al. to the CoRu underlayer taught by Futamoto '893 as modified by Futamoto '667.

47. One would have been motivated to make this modification due to the teaching in Suzuki et al. that adding 0.1-10 at. % oxygen to an underlayer of a magnetic recording medium reduces the grain size of the underlayer, thus reducing the noise of a magnetic layer disposed on the underlayer.

48. Futamoto '893 as modified by Futamoto '667 does not teach a magnetic layer that contains 0.2-15 at. % oxygen or nitrogen, as required by claim 13.

49. However, Suzuki et al teaches that adding 0.1-15 at. % oxygen to a magnetic layer of a magnetic recording layer reduces the grain size of the magnetic layer, thereby reducing the noise of the recording medium (column 3, line 67-column 4, line 5).

50. Therefore it would have been obvious to one with ordinary skill in the art at the time the invention was made to add 0.1-15 at% oxygen as taught by Suzuki et al to the magnetic layer of Futamoto '893 as modified by Futamoto '667.

51. One would have been motivated to make this modification due to the teaching in Suzuki et al. that adding oxygen to the magnetic layer of a recording medium improves the noise of the medium.

52. Regarding the combination of Futamoto '893 as modified by Futamoto '667 with Suzuki. The examiner acknowledges that the end product of Futamoto '893 as modified

by Futamoto '667 (a perpendicular recording medium) and the end product of Suzuki (a longitudinal medium) are fundamentally different. However, the examiner is merely relying on the teaching in Suzuki that the addition of oxygen to a magnetic layer is known to reduce the grain size of the magnetic layer. One of ordinary skill in the art would expect this reduction in grain size irrespective of the magnetic orientation of the layer. Thus, one of ordinary skill in the art would have been motivated with a reasonable expectation of success to add oxygen to the magnetic layer utilized by Futamoto '893 as modified by Futamoto '667 per the teaching in Suzuki.

53. Claims 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Futamoto '893 as modified by Futamoto '667 as applied to claim 5 above, and further in view of Wu et al. (US6218003).

54. Futamoto '893 as modified by Futamoto '667 does not teach a non-magnetic metal ground layer that contains at least one material selected from oxides, nitrides, carbides, and carbon, as required by claim 9, specifically one of the oxides, nitrides, or carbides listed by claim 10.

55. The examiner interprets the limitations of claim 10 to only require that the plurality of layers contains an oxide, nitride, or carbide, not that each layer in the plurality contains the recited compounds.

56. Bearing this in mind, Wu et al. teaches that the recording density, coercivity, signal to noise ratio, and signal pulse characteristics of a magnetic recording medium can be improved by adding TiO_2 to a Cr alloy underlayer utilized in the media (column 3, lines 1-7).

57. Therefore it would have been obvious to one with ordinary skill in the art at the time the invention was made to add TiO_2 as taught by Wu et al. to the $CoRu_xCr_y$ alloy underlayer utilized by Futamoto '893 as modified by Futamoto '667

58. One would been motivated to make such a modification due to the teaching in Wu et al that the magnetic properties of a magnetic recording medium can be improved by adding TiO_2 to a Cr alloy underlayer utilized in the formation of the media, and the fact that the $CoRu_xCr_y$ underlayer utilized by Futamoto '893 as modified by Futamoto '667 is a Cr alloy underlayer.

59. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Futamoto '893 as modified by Futamoto '667 as applied to claim 15 above, further in view of Honda et al. (US5851643).

60. Futamoto '893 as modified by Futamoto '667 does not teach a magnetic recording medium wherein the magnetic layer is constructed by a plurality of metal magnetic thin films, with at least one intermediate layer inserted there between, wherein the intermediate layer is made of at least one kind of material selected from Pt, Pd, and Ni, as required by claim 11.

61. However, Honda et al. teaches that a magnetic recording medium that exhibits reduced read back noise can be formed by utilizing a magnetic film that is formed by laminating two magnetic layers together with an intervening non-magnetic layer (column 9, lines 55-64). Suitable materials for forming the intermediate layer include Ru, Pt, or Pd (column 17, lines 54-61).

62. Therefore it would have been obvious to one with ordinary skill in the art at the time the invention was made to utilize Ru, Pt or Pd as taught by Honda as the intermediate layer in the multilayer magnetic film utilized by Futamoto '893 as modified by Futamoto '667, as Honda teaches the equivalence to Ru based intermediate layers to Pt and Pd based intermediate layers.

Response to Arguments

63. Applicant's arguments filed 1/27/2004 have been fully considered but they are not persuasive. In the instant case the applicant presented a plurality of arguments against the prior applied rejections.

64. First, applicant argued against the previously applied 35 U.S.C 112 rejections. These arguments are moot, as these rejections have been withdrawn. If applicant has concerns about how the instant claims are being interpreted, the examiner would be happy to discuss the issue with the applicant in an interview.

65. Second, applicant has argued that Futamoto '893 fails to disclose the Ru concentration of the first underlayer. As a result, applicant argues that the combination of references cannot meet the requirements of the instant claim 1. The examiner respectfully disagrees for the following reasons. First, the instant claims do not require each and every layer of the plurality of non-magnetic metal ground layers to contain ≥20 at. % Ru. Rather, the claim language requires "the plurality of layers to contain ≥20at. % Ru," which merely requires the plurality of layers to contain ≥20 at. % *in toto*. Second, Futamoto '893 expressly teaches that the first underlayer can be made of Ti or Ru, or Ti or Ru as a main element with an additive element also contained therein. Thus, even if

the instant claims required the 1st layer of the plurality to contain ≥20at% Ru (which they do not), the limitations would still be met because if the first underlayer is pure Ru, the Ru concentration is 100%, and if the layer is an Ru alloy where Ru is the "main" element, the Ru concentration is 50at% or more. In either case the applicant's claim limitations are clearly met.

66. Third, the applicant has correctly argued that in order to show a *prima facie* case of obviousness, all of the claim limitations must be taught or suggested by the prior art. Further, applicant has correctly asserted that obviousness cannot be established though a combination of references without some suggestion to combine the references. However, the applicant t has argued that the examiner has not met this burden of establishing a *prima facie* case of obviousness. The examiner respectfully disagrees.

67. The examiner recognizes that references cannot be arbitrarily combined and that there must be some reason why one skilled in the art would be motivated to make the proposed combination of primary and secondary references. *In Re Nomiya, 184* USPQ 607 (CCPA 1975). However, there is no requirement that a motivation to make the modification be expressly articulated. The test for combining references is what the combinations of disclosures taken as a whole would suggest to one of ordinary skill in the art. *In re McLaughlin*, 170 USPQ 209 (CCPA 1971). In the instant case, there is clear motivation to combine the references in the manner asserted. Those reasons are set forth above at sections 14-15, 33, 40, 46, 50, and 57 above. With respect to the obviousness of substituting equivalents, the applicant is respectfully reminded that substitution of equivalents requires no express motivation as long as the prior art

recognizes the equivalency. *In Re Fount* 213 USPQ 532 (CCPA 1982); *In Re Siebentritt* 152 USPQ 618 (CCPA 1967); *Grover Tank & Mfg. Co. Inc V. Linde Air Products Co.* 85 USPQ 328 (USSC 1950). Thus, this argument is unpersuasive.

68. Applicant's remaining arguments are based upon those above and are thus unpersuasive as well.

69. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nikolas J. Uhlir whose telephone number is 571-272-1517. The examiner can normally be reached on Mon-Fri 7:30 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul J. Thibodeau can be reached on 571-272-1516. The fax phone

number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

nju

Paul Thibodeau
Supervisory Patent Examiner
Technology Center 1700